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two is largely word-meaning. It is safe to say that meanings in reading are mainly feeling reactions and motor attitudes attaching most intimately to, or fused with, the inner utterance of the words, and especially of the sentences, that are read. Chapter IX treats of the rate of reading, and the factors which condition speed. While the difference in reading time from page to page is small with individual readers, each falling into a reading pace most natural to him, the rate of reading varies greatly with different individuals. Experiments by Huey and Dearborn show that there can usually be much improvement. The thing to do is to make an effort to get away from our usual plodding pace, to read persistently as fast as possible and with well concentrated attention.

Part II, embracing chapters X to XIII, discusses "The Beginnings of reading, in the interpretation of gestures and pictures," "The Evolution of an alphabet and of reading by alphabetic symbols," "The Evolution of the printed page," and "The History of reading methods and texts."

The pedagogy of reading is taken up in the next six chapters (Part III) which are given to the following topics: "Present-day methods and texts in elementary reading," "The Views of representative educators concerning early reading," "Learning to read at home," "Learning to read at school," "Reading as a discipline, and as training in the effective use of books," "What to read; the reading of adolescents."

In part IV, treating of the hygiene of reading, "Reading fatigue" and "Hygienic requirements in the printing of books and papers" are discussed.

In the concluding chapter Dr. Huey takes up the future of reading and printing, showing possibilities of improvement which have never been canvassed, and for the elimination of waste. What we need now is more of particular researches on specific problems to furnish us with yet more of fact and of suggestion.

M. W. MEYERHARDT.

Das Pferd des Herrn von Osten (Der kluge Hans), ein Beitrag zur experimentellen Tier- und Menschen-Psychologie, von OSKAR PFUNGST. Leipzig, Johann Ambrosius Barth, 1907. pp. 193.

It is rare that an experimenter is able to make a notable contribution, in a single piece of work, to both human and animal psychology, but that Dr. Pfungst has done in the case of a baffling problem by acute observation and a systematic application of the experimental method. The situation was briefly this. In 1904 there appeared in Berlin a remarkable reckoning stallion, the property of a retired schoolmaster living in one of the meaner quarters of the city, and making no effort to profit by the exhibition of his property. The horse was able besides doing other wonderful things to indicate by taps of his hoof the answers to problems involving the usual rules of simple arithmetic, including fractions, and to do this not only in the presence of his master, but also when the latter was absent and the problems were proposed by others whom it was quite impossible to suspect of fraud or collusion. Public interest in the matter was considerable and different sections of the public passed characteristic judgments upon the case. One party declared the case nothing but a piece of clever trickery; another held it to be a definite demonstration, at last, that animals could reason; while a third saw in it something occult, perhaps a case of telepathic transference of the results of the calculations from the mind of the master to that of the horse. The old schoolmaster himself declared that he had simply taught the horse arithmetic by regular pedagogical methods and that the horse had learned as children learn. Public interest ran so high that an in-

formal committee, composed of a number of distinguished scientific and practical men, made an investigation and published a report. In this they completely exonerated the schoolmaster of prompting the horse by intentional signals, and stated the opinion that unintentional signals of known sorts were absent. From this last statement the public promptly inferred that the committee meant to say that the horse did his own thinking, disregarding the remaining possibility that his behavior was regulated by unintentional signs of a sort as yet unknown.

At this point a systematic experimental attack upon the problem was begun by Professor Stumpf and his pupils which presently led to Dr. Pfungst's discovery of the set of minimal unconscious movements of the body and head by which the horse was set to tapping and again stopped at the number required. Once discovered, Dr Pfungst was able not only to execute these movements voluntarily (like the others who were able to get replies from the horse he had been executing them long unconsciously before he discovered them) and so lead the horse to any reply to any question, but he was able also to guide others to the observation of them in all those who succeeded in getting replies from the horse, and finally to demonstrate on a number of subjects in the laboratory similar and equally unconscious movements.

With this clue it was possible to explain in detail all the essential phenomena observed, even to the characteristic 'blunders' and 'mistakes' of the horse, and to give a natural explanation of how such a system of unconscious signalling by the master and of response by the horse could have grown up in the course of such "education" as the horse had received at the hands of Herr von Osten.

The explanation is doubtless absolutely correct and yet who would have ventured beforehand that differences in attention could explain so much — the delicate responsiveness of the horse to the movements of his master when his securing of bread and carrots depended upon it, and the obliviousness of the master to these same movements when his thoughts were otherwise engaged. The study is, all in all, a model in its field, and ought to be promptly translated into English.

For the details the text itself will, of course, be consulted. It includes, besides the six chapters of Dr. Pfungst, an introduction by Professor Stumpf, four appendices (on Herr von Osten's method of teaching, the report of the above mentioned committee, extracts from its protocol, and the final report made by Professor Stumpf in December, 1904) and a bibliography of 124 titles. E. C. S.

Are Bees Reflex Machines? An Experimental Contribution to the Natural History of the Honey Bee, by H. v. Buttell-Reepen, Ph. D. Translated by Mary H. Geisler. The A. I. Root Co., Medina, Ohio, 1907. pp. 48.

It is a pleasure to welcome, in an English version, this account of bee psychology by a German master of it. The work appeared first as a series of papers in the *Biologisches Centralblatt*, Vol. XX, 1900, as a counter blast to Bethe's stimulating but inadequate studies of ants and bees (Bethe: *Dürfen wir Ameisen und Bienen psychische Qualitäten zuschreiben?* *Pflüger's Archiv*, LXX, 1898), but is controversial only in presenting vividly the contrary facts. The work is full of interesting first hand observation with abundant references to literature and cannot fail, in its present form, to be useful to English students of bee behavior.

The difficulties and defects of psychological terminology are considerable at the best, but in comparative psychology they stand out in all their enormity. Hardly anywhere else would one meet in the same